

WHAT IS CLAIMED IS:

- 1 1. A self-compacting, fiber-reinforced engineered cementitious
2 composite comprising:
3 cementitious material comprising:
4 cement and sand;
5 at least one polymeric thickener;
6 at least one superplasticizer; and
7 water; and
8 from 0.5 to 10 volume % of hydrophilic reinforcing fibers.
- 1 2. The composite of claim 1 wherein the hydrophilic fibers
2 comprise polyvinyl alcohol fibers.
- 1 3. The composite of claim 1 further comprising hydrophobic
2 fibers.
- 1 4. The composite of claim 1 wherein the hydrophilic fibers have
2 a tenacity of about 1000 - 2500 MPa.
- 1 5. The composite of claim 1 wherein the polymeric thickener and
2 the superplasticizer are provided as a single chemical serving both the functions of
3 the polymeric thickener and superplasticizer.
- 1 6. The composite of claim 5 wherein the hydrophilic fibers have
2 a modulus (E) of about 30 - 60 GPa.
- 1 7. The composite of claim 6 wherein the hydrophilic fibers have
2 a diameter of about 10 - 60 μm .
- 1 8. The composite of claim 7 wherein the hydrophilic fibers have
2 a length of about 5 - 30 mm.

1 9. The composite of claim 1 wherein the hydrophilic fibers are
2 coated with an oiling agent.

1 10. A method of making a composite structural material
2 (engineered cementitious composite), said method comprising:
3 mixing from 0.5 to 10 volume % of hydrophilic reinforcing fibers
4 with cementitious material comprising cement and sand, at least one polymeric
5 thickener, at least one superplasticizer, and water.

1 11. The method of claim 10 wherein the hydrophilic fibers
2 comprise polyvinyl alcohol fibers.

1 12. The method of claim 10 further comprising hydrophobic
2 fibers.

1 13. The method of claim 10 wherein the hydrophilic fibers have
2 a tenacity of about 1000 - 2500 MPa.

1 14. The method of claim 13 wherein the hydrophilic fibers have
2 a modulus (E) of about 30 - 60 GPa.

1 15. The method of claim 14 wherein the hydrophilic fibers have
2 a diameter of about 10 - 60 μ m.

1 16. The method of claim 15 wherein the hydrophilic fibers have
2 a length of about 5 - 30 mm.

1 17. The method of claim 10 wherein the composite structural
2 material is cast without the use of any external vibration.

1 18. The method of claim 16 wherein the composite structural
2 material is cast without the use of any external vibration.

1 19. The method of claim 9 wherein the hydrophilic fibers are
2 coated with an oiling agent.

1 20. A method of making a composite structural material
2 (engineered cementitious composite), said method comprising:

- 3 1) mixing powders of dry cement, sand, fly ash and defoamer;
4 2) mixing the dry powder mixture of 1) with water;
5 3) mixing an aqueous solution of cellulose compound with the
6 mixture of 2);
7 4) mixing an aqueous solution of superplasticizer with the
8 mixture of 3); and
9 5) mixing hydrophilic fibers with the mixture of 4).

1 21. The method of claim 20 wherein the components and the
2 mixture of 2) are mixed for about 2 minutes, wherein the components of mixture 3)
3 are mixed for about 5 to 10 minutes, and wherein the components of mixture 4) are
4 mixed for about 2 minutes.

1 22. The method of claim 21 wherein additional water is mixed
2 with the mixture of 5).

1 23. The method of claim 20 wherein the reinforcing hydrophilic
2 fibers are pre-soaked in water before being mixed with the mixture of 4).

1 24. The method of claim 20 wherein the hydrophilic fibers are in
2 random, discontinuous form.

1 25. The method of claim 20 wherein the hydrophilic fibers are
2 provided in a bundle form.